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(71) Applicant
Mitsubishi Pencil Co. Ltd.

(Incorporated in Japan)

23-37 5-chome Higashi Ohi, Shinagawa-ku, Tokyo, Japan

(72) Inventor
Kiyohiko Fukazawa

(74) Agent and/or Address for Service
D. Young & Co
10 Staple Inn, London, WC1V 7RD

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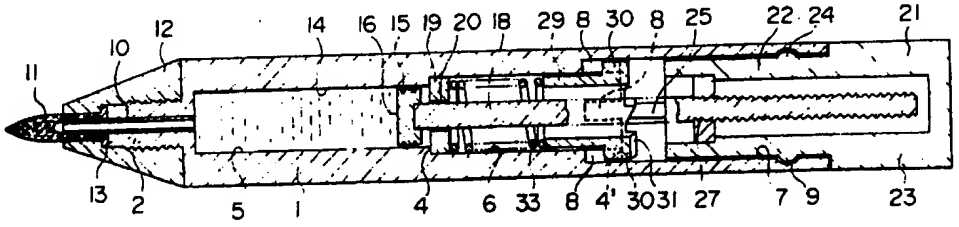
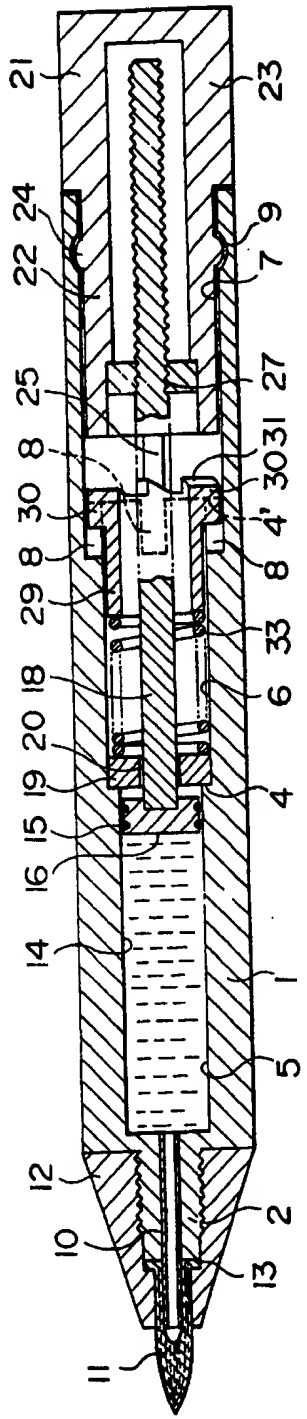
Selected US specifications from IPC sub-class A46B

(54) Liquid applicator

(57) A liquid applicator such as a cosmetic writing or like instrument is provided with a piston 16 for forcibly feeding application liquid to a liquid application member 11 from a liquid reservoir 14. The piston is fixedly mounted to a front end of a threaded rod 18 and is axially advanced by the threaded rod when the latter is rotatably driven by the user by means of a rotary control sleeve 21 provided in a rear end of the applicator. When the control sleeve is rotated, a rigid cam projection 25 provided in a front-end surface of the control sleeve acts as a detent with respect to a cylindrical cam follower 29 urged resiliently against the cam projection and produces a click each time the cam projection passes a rear-end projection 31 of the cam follower; the rotary control sleeve is rotable in only a single direction and axial movement thereof is prevented by ridge 24 which engages groove 9 of shaft sleeve 1.



The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.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LIQUID APPLICATOR

The present invention relates to a liquid applicator such as: cosmetic instruments employing cosmetic liquid such as an eyeliner, mascara, nail polish and the like; writing instruments employing ink such as a marking pen, felt-tipped pen and the like; and other applicator for applying other application liquid, and more particularly to a liquid applicator for forcibly feed the application liquid to a liquid-application portion of the instrument.

Hitherto, there has been provided a liquid applicator in which: a reservoir portion for receiving the application liquid therein is provided in the interior of a shaft sleeve of the applicator, the reservoir portion communicating with the liquid-application portion of the applicator; an axially-movable member such as a piston is mounted in the reservoir portion of the applicator; a rotary control member is provided in a rear-end portion of the shaft sleeve of the applicator, and rotatably driven to move the axially-movable member such as the piston forward in a screw-driving manner so that the

application liquid is forcibly fed to the liquid-application portion from the reservoir portion of the applicator. Such conventional liquid applicator is disclosed in, for example, Japanese Utility Model Publication No. 50-10925.

In such conventional liquid applicator, however, in case that it is necessary to keep a feed rate of the application liquid at a certain level, namely, in case that the axially-movable member such as the piston of the applicator is advanced at a certain rate, it is necessary to precisely control the rotary control member of the applicator in its rotation. However, it is very cumbersome for the user to precisely control the rotary control member of the applicator even when a graduated scale is provided in a rotary knob of the rotary control member of the applicator, because the reading of such scale makes the user tired and leads to misreading. Such misreading often causes the rotary control member to be reversely rotated so that air is sucked into the reservoir portion of the applicator and expanded when the temperature of the applicator increases. Such expansion of the air in the reservoir portion causes the application liquid to drop from the liquid-application member of the applicator. These are problems inherent in the conventional liquid applicator. Therefore,

the present invention provides a novel liquid applicator which may resolve the above problems.

The present invention provides a novel liquid applicator such as cosmetic instruments, writing instruments and like instruments comprising: a tubular shaft sleeve; a liquid-application member connected to a front-end portion of said shaft sleeve; a liquid reservoir portion communicating with said liquid-application member, said reservoir portion being provided in said shaft sleeve; a piston provided in said reservoir portion so as to be axially slidable while brought into a watertight contact with said reservoir portion; a threaded rod connected to said piston, said threaded rod being provided with a screw portion at least in its rear portion; a stopper means for preventing said threaded rod from rotating; a rotary control sleeve rotatably mounted in a rear-end portion of said shaft sleeve in an insertion manner, said rotary control sleeve being prevented from moving in an axial direction of said shaft sleeve while provided with a rigid cam projection having an oblique front-end surface; a cylindrical cam follower interposed between said liquid reservoir portion and said rotary control sleeve, said cylindrical cam follower being provided with a rear-end projection consisting

of a vertical wall extending substantially parallel to a longitudinal axis direction of said shaft sleeve and an oblique wall obliquing from said vertical wall at a sharp angle, said cylindrical cam follower being engaged with said cam projection of said rotary control sleeve; a guide means for guiding said cylindrical cam follower which is prevented from rotating about its longitudinal axis by said guide means which permits said cylindrical cam follower to move in a longitudinal direction of said shaft sleeve, said guide means being constructed of its components which are provided in both an inner wall of said shaft sleeve and said cylindrical cam follower; a coil spring for always urging said cam follower rearward, said coil spring being provided in a position in front of said cylindrical cam follower; and a driving means for driving said threaded rod, said driving means being provided inside said rotary control sleeve.

In the liquid applicator of the present invention, it is possible to provide a plurality of the rear-end projections of the cylindrical cam follower and a plurality of the cam projections.

The driving means for driving the threaded rod of the applicator of the present invention may be a threaded hole provided inside the rotary control sleeve, or may be a separate member provided with a female screw

which is positioned in a central portion of the separate member and meshes with the threaded portion of the threaded rod, the separate member being fixed to the rotary control sleeve inside the same.

It is preferable that the guide means for guiding the cylindrical cam follower is constructed of: a groove provided in an inner wall of the shaft sleeve; and a projection provided in an outer peripheral surface of the cylindrical cam follower, or constructed of: a projection provided in the inner wall of the shaft sleeve; and a groove provided in the outer peripheral surface of the cylindrical cam follower.

The drawing shows a longitudinal sectional view of an embodiment of the liquid applicator of the present invention.

Hereinbelow, an eyeliner, which is an embodiment of the liquid applicator of the present invention, will be described in detail with reference to the drawing.

As shown in the drawing, the reference numeral 1 denotes a tubular shaft sleeve of the liquid applicator of the present invention. In a front-end portion of the shaft sleeve 1 of the applicator, there is provided a small-diameter projection 2 to a front-end portion of

which is connected a brush tip 11 which is provided with a rear-end flange 13 in its base portion. A front shaft 12 is threadably connected to the small-diameter projection 2 of the shaft sleeve 1 through the rear-end flange 13 of the brush tip 11 so as to fix the brush tip 11 to the shaft sleeve 1.

The reference numeral 10 denotes a liquid conduit through which a liquid reservoir portion 14 of the shaft sleeve for receiving an application liquid therein communicates with the brush tip 11. The liquid conduit 10 is fixedly mounted in a bore portion of the small-diameter projection 2 of the shaft sleeve 1 in an insertion manner so that a front-end portion of the liquid conduit 10 projects outward from the front end of the small-diameter projection 2 of the shaft sleeve 1 to enter the interior of the brush tip 11 at its front-end portion.

The brush tip 11 communicates with the liquid reservoir portion 14 of the shaft sleeve 1 through such liquid conduit 10, so that the application liquid is fed to the brush tip 11 from the liquid reservoir portion 14 of the shaft sleeve 1 through the liquid conduit 10.

The interior of the tubular shaft sleeve 1 increases stepwise in its inner diameter to form: a first interior part forming the bore of the small-diameter projection 2; a second interior part 5 which is positioned

behind the first interior part and larger in diameter than the first interior part or the bore of the small-diameter projection 2, and forms the liquid reservoir portion 14 of the shaft sleeve 1; a third interior part 6 which is positioned behind the second interior part 5 and larger in diameter than the second interior part; and a fourth interior part 7 which is positioned behind the third interior part 6 and larger than the third interior part 6. Shoulder portions 4 and 4' are formed in a position between the second 5 and the third 6 interior parts and in a position between the third 6 and the fourth 7 interior parts, respectively.

A plurality of guide grooves 8, which open into the shoulder portion 4' of the shaft sleeve 1, are provided in an inner wall of a rear-half portion of the third interior part 6 of the shaft sleeve 1 at interval of a certain distance in a circumferential direction of the shaft sleeve 1, which guide grooves 8 extend in a longitudinal direction of the shaft sleeve 1.

A cam projection 25, which is provided with an oblique surface in its front end, is provided in a predetermined position of a circumferential portion of a front-end surface of the rotary control sleeve 21 in a projecting manner.

The reference numeral 29 denotes a cylindrical

cam follower provided in a position in front of the rotary control sleeve 21. In an outer peripheral surface of a rear-end portion of the cylindrical cam follower 29, there are provided a plurality of elongated projections 30, which extend in a longitudinal direction of the shaft sleeve 1, at positions corresponding to those of the guide grooves 8 of the shaft sleeve 1. It is not necessarily required that the number of the projections 30 correspond to that of the guide grooves 8. The number of the projections 30 may be smaller than that of the guide grooves 8. The guide grooves 8 cooperate with the projections 30 in guiding the cylindrical cam follower 29. Alternatively, it is also possible to provide the projections 30 in the inner wall of the shaft sleeve 1, and the guide grooves 8 in the outer peripheral surface of the cylindrical cam follower 29.

The plurality of the projections 30, which are equally spaced from each other in a circumferential direction of the cylindrical cam follower 29, are provided in a rear-end surface of the cylindrical cam follower 29, each of which projections 30 is constructed of: a vertical wall extending substantially parallel to a longitudinal axis of the shaft sleeve 1; and an oblique wall obliquing from the vertical wall at a sharp angle. An outer diameter of the cylindrical cam follower 29 is

so determined that the cylindrical cam follower 29 is snugly inserted into the third interior part 6 of the shaft sleeve 1. At this time, the projections 30 of the cylindrical cam follower 29 are inserted into the guide grooves 8 of the shaft sleeve 1. Consequently, the shaft sleeve 1 prevents the cylindrical cam follower 29 from rotating about its longitudinal axis, but permits the cylindrical cam follower 29 to move in a longitudinal direction of the shaft sleeve 29.

A coil spring 33 is interposed between the cylindrical cam follower 29 and a stopper means 19 for preventing the threaded rod from rotating about its longitudinal axis, so that the cylindrical cam follower 29 is urged rearward under the influence of a resilient force of the coil spring 33, whereby the projections 30 of the cylindrical cam follower 29 are always engaged with the cam projection 25 of the rotary control sleeve 21.

A groove 9 is provided in an inner wall of the shaft sleeve 1 at a position near the rear end of shaft sleeve 1 to extend in a circumferential direction of the inner wall of the shaft sleeve 1.

A piston 16 is axially slidably inserted into the liquid reservoir portion 14 of the shaft sleeve 1. The application liquid is received in the liquid reservoir portion 14 at a position in front of the piston 16.

O-rings 15 are mounted on an outer peripheral surface of the piston 16 so that the piston 16 is brought into a watertight contact with an inner surface of the liquid reservoir portion 14 through the O-rings 15 to prevent the application liquid from leaking from the liquid reservoir portion 14. It is possible to replace the O-rings 15 with any other suitable means for preventing the application liquid from leaking from the liquid reservoir portion 14.

A threaded rod 18 is fixed to a rear side of the piston 16, and passes through the third interior part 6 of the shaft sleeve 1 to enter the fourth interior part 7 of the shaft sleeve 1. A rear-half portion of the threaded rod 18 forms a male screw, while a front-half portion of the threaded rod 18 is not threaded to form a square-column portion.

It is possible that the threaded rod 18 assumes a square-column shape as a whole. In this case, longitudinal edges of such square-column-shaped rod 18 is threaded.

It is also possible that the threaded rod 18 assumes a circular-column shape as a whole.

The reference numeral 19 denotes a stopper means for preventing the threaded rod 18 from rotating about its longitudinal axis, provided that the stopper means 19 permits the threaded rod 18 to move axially relative

to the shaft sleeve 1.

The stopper means 19 is provided with a central hole 20 a shape of which corresponds to that of the cross section of the front-half portion of the threaded rod 18, so that the threaded rod 18 is slidably inserted into the central hole 20 of the stopper means 19. Consequently, it is possible for the threaded rod 18 to axially move relative to the stopper means 19, but not possible to rotate about its longitudinal axis. In case that the threaded rod 18 assumes a circular-column shape as a whole, another stopper means is required. For example, a ridge extending in a longitudinal direction of the shaft sleeve 1 is integrally formed in an outer peripheral surface of such threaded rod 18 to provide such another stopper means, provided that the central hole 20 assumes a shape corresponding to a cross section of such threaded rod 18 having the ridge.

The reference numeral 21 denotes a rotary control sleeve a front-half portion 22 of which is rotatably mounted in the fourth interior part 7 of the shaft sleeve 1. An outer diameter of the front-half portion 22 of the rotary control sleeve 21 is slightly smaller than the inner diameter of the fourth interior part 7 of the shaft sleeve 1 to make it possible that the front-half portion 22 of the rotary control sleev 21 fits in the

fourth interior part 7 of the shaft sleeve 1. An outer diameter of a rear-half portion 23 of the rotary control sleeve 21 is substantially corresponding to the outer diameter of the rear-end portion of the shaft sleeve 1.

An annular ridge 24 corresponding to the groove 9 of the shaft sleeve 1 is provided in the outer peripheral surface of the front-half portion 22 of the rotary control sleeve 21 at a position corresponding to that of groove 9 when the rotary control sleeve 21 is mounted in the fourth interior part 7 of the shaft sleeve 1. Such ridge 24 of the rotary control sleeve 21 engages with the groove 9 of the shaft sleeve 1 so that the rotary control sleeve 21 is rotatably mounted in the rear-end portion of the shaft sleeve 1, while prevented from moving axially.

The cam projection 25, which is rigid, is provided in the front-end surface of the rotary control sleeve 21. A front end of the cam projection 25 is defined by the oblique wall, so that the cam projection 25 assumes a trapezoid shape as a whole. In the embodiment of the present invention shown in the drawing, the number of the cam projection 25 is single. However, it is also possible to provide a plurality of the cam projections 25 in the rotary control sleeve 21. In a condition in

which the rotary control sleeve 21 is mounted in the shaft sleeve 1, the front-end portion of the cam projection 25 engages with a rear-end projection 31 of the cylindrical cam follower 29. In a rear-end view of the liquid applicator shown in the drawing, when the user rotates the rotary control sleeve 21, the rotary control sleeve 21 can rotate counterclockwise since the cylindrical cam follower 29 is moved forward against the resilient force of a coil spring 33 by the rigid cam projection 25 which, at this time, abuts on the oblique wall of the rear-end projection 31 of the cylindrical cam follower 29 to urge the same 29 forward. In contrast with this, it is not possible for the user to rotate the rotary control sleeve 21 clockwise in the rear-end view of the liquid applicator shown in the drawing since the rigid cam projection 25 of the rotary control sleeve 21 abuts on the vertical wall of the rear-end projection 31 of the cylindrical cam follower 29 to act as a detent. Consequently, as is clear from the above description, it is possible for the user to rotate the rotary control sleeve 21 counterclockwise only in the rear-end view of the liquid applicator shown in the drawing. During the rotational operation of the rotary control sleeve 21, a click is produced at each time when the rigid cam projection 25 of the rotary control sleeve 21 passes the rear-end

projection 31 of the cylindrical cam follower 29, because the rigid cam projection 25 of the rotary control sleeve 21 is hit with a flat rear-end surface of the cylindrical cam follower 29 under the influence of the resilient force of the coil spring 33 after the rear-end projection 31 of the cylindrical cam follower 29 is moved forward against the resilient force of the coil spring 33 to pass the rigid cam projection 25 of the rotary control sleeve 21.

Inside the rotary control sleeve 21 is provided a driving member 27 which is fixedly mounted in the rotary control sleeve 21 while provided with a female screw in its central portion, which female screw is threadably engaged with the threaded portion of the threaded rod 18. The driving member 27 may be fixed to the rotary control sleeve 21 by means of a suitable means. It is also possible to replace such separate driving means 27 with a threaded hole formed in the rotary control sleeve 21.

The threaded portion or a male screw portion of the threaded rod 18 is threadably engaged with the female screw of the driving member 27 and moves the threaded rod 18 forward when the rotary control sleeve 21 is rotated by the user in the single direction mentioned above.

The threaded rod 18 has a sufficient length so that it is possible to move the piston 16 to the foremost position of the liquid reservoir portion 14 of the shaft sleeve 1.

The above components of the liquid applicator of the present invention may be made of conventional materials. It is also possible to cover the brush tip 11 with a cap (not shown) in order to protect the brush tip 11 from damage.

In operation, the rotary control sleeve 21 is rotated by the user so that the piston 16 is moved forward by the threaded rod 18. Under such circumstances, since the rotary control sleeve 21 is kept stationary in the axial direction of the shaft sleeve 1, the cylindrical cam follower 29 is moved forward against the resilient force of the coil spring 33 by the rigid cam projection 25 of the rotary control sleeve 21 and returns to its initial position when the rear-end projection 31 thereof passes the rigid cam projection 25 of the rotary control sleeve 21 to hit the rigid cam projection 25, whereby the click is produced at each time when the rear-end projection 31 of the cylindrical cam follower 29 passes the rigid cam projection 25 of the rotary control sleeve 21.

In use, it is possible for the user to sense

the thus produced click in hearing and feeling. Consequently, it is very easy for the user to control the rotary control sleeve 21 in feeding the application liquid to the brush tip 11 from the liquid reservoir portion 14 by the use of the piston 16.

In this case, since there is no fear that the rotary control sleeve 21 is reversely rotated, there is no fear that the piston is moved rearward to cause the air to enter the liquid reservoir portion 14 of the shaft sleeve 1.

CLAIMS

1. A liquid applicator comprising:

a tubular shaft sleeve;

a liquid-application member at a front-end portion of said shaft sleeve;

a liquid reservoir portion communicating with said liquid-application member, said reservoir portion being provided in said shaft sleeve;

a piston in said reservoir portion so as to be axially slidable while in sealing contact with said reservoir portion;

a threaded rod connected to said piston, said threaded rod being provided with a screw portion at least at its rear portion;

means for preventing said threaded rod from rotating;

a rotary control sleeve rotatably mounted at a rear-end portion of said shaft sleeve, said rotary control sleeve being prevented from moving in an axial direction of said shaft sleeve, and having at least one rigid cam projection with an oblique front-end surface;

a cylindrical cam follower interposed between said liquid reservoir portion and said rotary control sleeve, said cylindrical cam follower having a rear-end projection comprising a perpendicular wall extending substantially parallel to the longitudinal axis of said shaft sleeve and an oblique wall extending from said perpendicular wall at an acute angle, said cylindrical cam follower engaging with said cam projection of said rotary control sleeve;

a guide means for guiding said cylindrical cam follower which is prevented from rotating about its longitudinal axis by said guide means and which permits said cylindrical cam follower to move in a longitudinal direction of said shaft sleeve, said guide means being constructed of its components which are provided in both an inner wall of said shaft sleeve and said cylindrical cam follower;

resilient means for urging said cam follower rearward, said resilient means being provided in front of said cylindrical cam follower; and

a driving means for driving said threaded rod, said driving means being provided inside said rotary control sleeve.

2. A liquid applicator according to claim 1, wherein: a plurality of said rear-end projections of said cylindrical cam follower are provided.

3. A liquid applicator according to either of claims 1 and 2, wherein: said driving means for driving said threaded rod comprises a threaded hole in said rotary control sleeve, said threaded hole being a through-hole.

4. A liquid applicator according to either of claims 1 and 2, wherein: said driving means for driving said threaded rod comprises a separate member having a female screw which is threadably engaged with said male screw of said threaded rod, said separate member being fixedly mounted inside said rotary control sleeve.

5. A liquid applicator according to any preceding claim, wherein: a plurality of said rigid cam projections of said rotary control sleeve are provided.

6. A liquid applicator according to any preceding claim, wherein: said guide means for guiding said cylindrical cam follower comprises a groove in an inner wall of said shaft sleeve and a projection in an outer peripheral surface of said cylindrical cam follower.

7. A liquid applicator according to any one of claims 1 to 5, wherein: said guide means for guiding said cylindrical cam follower comprises a projection in an inner wall of said shaft sleeve and a groove in an outer peripheral surface of said cylindrical cam follower.

8. A liquid applicator according to any preceding claim in the form of a writing or painting instrument or a cosmetics applicator.

9. A liquid applicator according to any preceding claim substantially as herein described.

10. A liquid applicator substantially as herein described with reference to the accompanying drawing.

11. Each and every novel feature and combination of features substantially as herein disclosed.

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